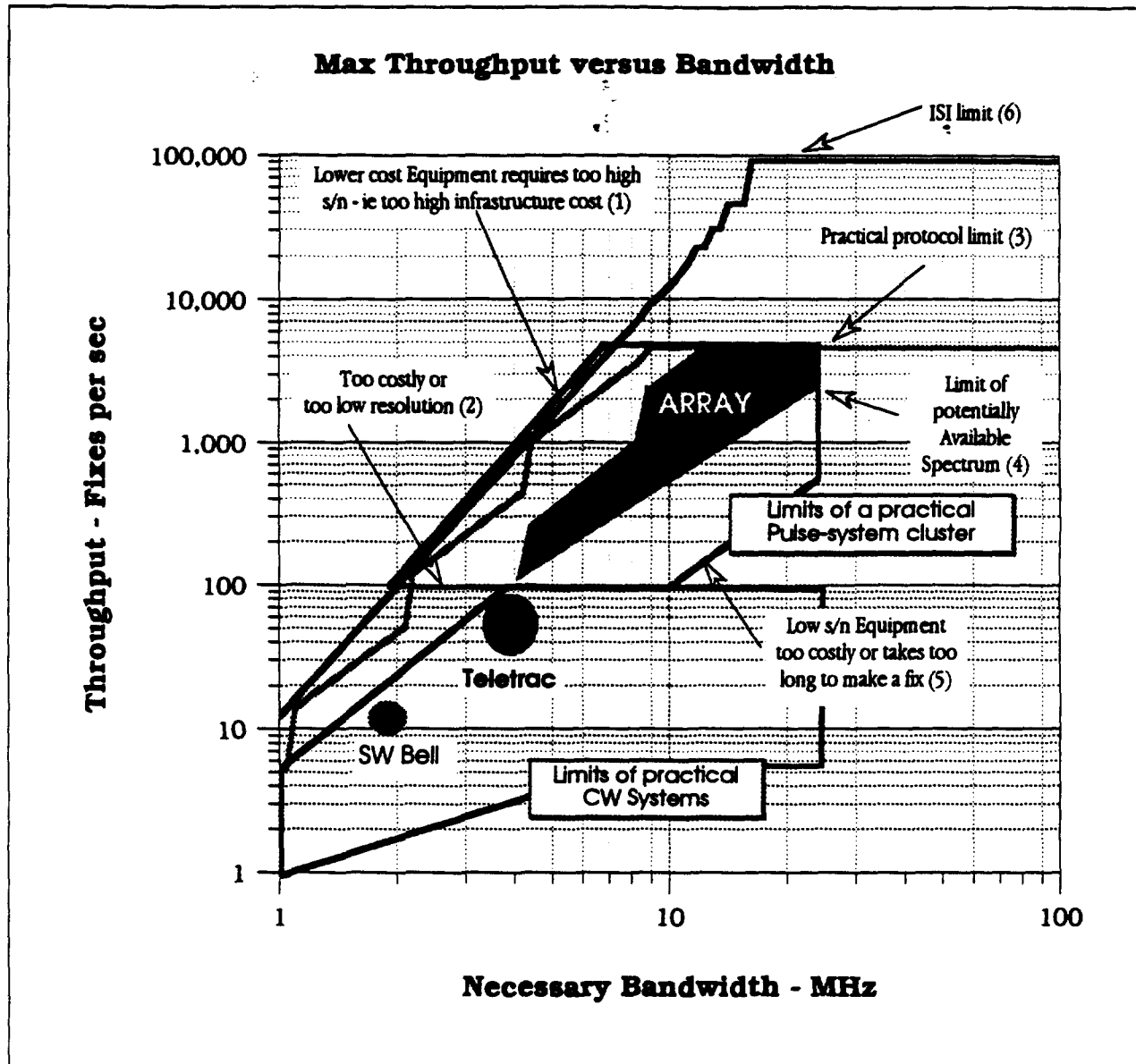


Figure 12. Illustration of Bounds



The figure depicts the relationships between position-fixing throughput versus occupied bandwidth. Multilaterating systems such as ARRAY are bound by somewhat arbitrary but practical limits illustrated by the pentagon having sides (1) through (5). See Exhibit A to Pinpoint's opening comments in PR Docket 93-61 for a more complete discussion of the factors

affecting the position-fixing rates for different automatic vehicle monitoring multilateration system approaches.

The theoretical curve shows the possible throughput for a particular time resolution and signal-to-noise ratio. It is limited at wider bandwidths by inter symbol interference (ISI) that would result from the pulse-expansion sequence duration being longer than the separation between pulses. The derivation of the line presumes an unconstrained size to the length of suitable expansion & compression sequences. However, the practical curve (stepped ramp) shows the results obtained by constraining the sequences to real values, (typically of length $2^n - 1$, where n has integer values). Practical rates are further limited at larger bandwidths to a maximum of about 5000 fixes per second by the requirements of typical radio-communication protocols, involved in the control and management of the radio-location process (addressing, operation codes, status, check characters, etc.) This requirement forms side (3) of the bounding area.

As the s/n ratio is increased, or the required resolution is reduced, the throughput increases. However, increasing the s/n ratio increases the cost of the infrastructure by requiring more base stations per square mile or more power output per base station, and the timing resolution can only be reduced to meet the operational requirements of the overall system. This creates the bound (1).

Boundary (2) is mainly economic one. At some ratio of infrastructure cost to system performance (in terms of throughput and resolution), and hence revenue generating capability, to infrastructure cost becomes too low for the system to be viable.

Boundary (4) is imposed by the potentially available bandwidth, which is a regulatory limit (or may be a financial limit if spectrum is auctioned).

Boundary (5) arises from equipment operating at too low a s/n ratio, requiring too great a complexity to dig the information out of the noise, or the system would be operating very slowly, severely restricting the throughput of the system.

Appendix C

Pinpoint Communications, Inc.

ANALYSIS OF THE ECONOMICS OF CHANNEL EXCLUSIVITY FOR WIDE-AREA LOCATION MONITORING SYSTEMS

by

W. Wayne Stargardt

Pinpoint Communications, Inc.

ANALYSIS OF THE ECONOMICS OF
CHANNEL EXCLUSIVITY FOR
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1.0 Introduction

As part of its comments in FCC Rulemaking 93-61, PacTel Teletrac (PacTel) -- a subsidiary of the monopoly local telephone company in several western states -- proffers an assertedly objective and academic economic analysis supporting grant of exclusive franchises in the proposed Location and Monitoring Service (LMS). The appendix, by Richard Schmalensee and William E. Taylor, argues that exclusivity, which in turn implies the creation of an LMS duopoly, would best serve the public, consumer's interest.

PacTel and its consultants no doubt are used to arguing for the prevention of competition, possibly in the context of preserving their dominance in local exchange markets. Economic theory, however, teaches otherwise. As described below, even using the classical microeconomics relied upon by Schmalensee and Taylor, their conclusions are diametrically opposed to the economics on which they appear to rely. Moreover, more contemporary microeconomic analysis that more closely describes modern business environments confirm that the PacTel study is fundamentally erroneous and should not be relied upon by the Commission. Below, this paper analyzes the individual conclusions of the PacTel study under both classical and newer microeconomics and provides a point-by-point refutation.

2.0 Benefits Of Competition

2.1 Spectrum sharing will encourage the number and variety of competitors to increase.

In their attached appendix to the PacTel Comments, Mr. Schmalensee and Mr. Taylor argue in Section II-A that spectrum sharing will not necessarily cause the number of competitors to increase because new entrants into a geographic market will increase the proportion of fixed costs that each firm (including new

entrants) must bear, and that this will therefore discourage new entrants. The commenters further argue that spectrum sharing necessarily implies uncertainty about the ability of new entrants to earn an adequate return on their investments in capacity and in research and development, and that this uncertainty will further discourage investment by potential new entrants.

- 2.1.1 Mr. Schmalensee and Mr. Taylor are essentially arguing that the market for LMS services support the conditions of a natural monopoly (or duopoly), but their rationale for this conclusion is unconvincing. Since all markets require some fixed costs to serve and some sunk costs to enter, and since all new business ventures involve uncertainty of economic return because the reactions of customers and competitors can not be predicted precisely, the arguments advanced by Schmalensee and Taylor can be used to justify and predict monopolies or duopolies in any market. Because almost all markets involve fixed costs, sunk costs and uncertainty, and almost all markets are clearly not anything close to natural monopolies, the arguments advanced for suggesting that additional competitors will not enter the LMS market do not support the assertion. Clearly other factors determine the number of competitors which optimally serve a market at any time, and these other considerations are detailed below.

In particular, Schmalensee and Taylor present no evidence that the market for LMS services inherently would support only a monopoly or at best a duopoly of suppliers. They provide no data on the magnitude of fixed costs, and do not attempt to show rigorously that economics of scale preclude competition. Nor could they. Pinpoint's experience is that technological developments have made LMS a relatively easy to enter marketplace, albeit one with some startup costs. The record, however, suggests that the market is no more difficult to enter than, for example, PCS. Yet no one argues that PCS is a natural monopoly.

The ultimate refutation of the conceptual assertion that additional competitors will not enter this market is presented by the announced intent by Pinpoint, AT&T and Southwestern Bell to enter this market. It is ludicrous in the extreme to argue that spectrum sharing will not result in additional competitors when the facts so obviously contradict that statement.

- 2.1.2 In any case, the authors of this analytical brief are classical microeconomists and base their arguments on the precepts, assumptions and theory of classical microeconomics. A quarter of a century ago the intellectual underpinnings of microeconomics were reinvented based on in-depth and detailed empirical evidence uniquely gained while working inside leading companies across a range of industries. The new data revealed that companies actually worked under a very different set of rules than those predicted and espoused by classical microeconomics. This new approach to understanding the economic behavior of businesses was developed and expanded upon by a host of consulting firms specializing in corporate strategy, such as Boston Consulting Group, Bain & Co.,

Braxton & Associates, and Strategic Planning Associates. Traditional consulting firms such as McKinsey & Co. and Booz, Allen & Hamilton also adopted these principles of modern economic analysis in serving the needs of their clients. With its principles verified by competitor after competitor acting successfully in the marketplace, modern economic analysis has been subsumed into the thinking of managers and planners for major corporations everywhere, and has been woven into the teaching curriculum of almost every business school. Some members of the academic community who have close associations with corporations and consultants, such as Michael Porter, of the Harvard Business School, have published and promulgated the principles of modern economic analysis, but these academics tend to come from the business schools rather than from the mainstream academic community for economics. Many of the arguments advanced by Schmalensee and Taylor contradict the principles of modern economic analysis and the considerable weight of empirical evidence upon which they are based.

- 2.1.3 Under these new techniques, the classical microeconomics argument advanced by Schmalensee and Taylor that there is an equilibrium number of competitors in an industry which is dictated by market size and scale effects is fallacious. This argument is based upon a number of abstract assumptions which do not apply in real world situations. One of the assumptions of such an argument is that demand in the market is homogenous and that the needs of all buyers are the same. In fact, modern economic analysis has shown that customers in a market purchase not a single, well-defined product, but rather a range of associated products, services and intangible associations. Customers are not uniform in the breadth and importance of these needs which they are seeking to fulfill, but rather significant differences in needs and desires exist among potential customers. Customers in a market with relatively similar needs are grouped together into segments. Segments can be addressed by focused competitors, providing a superior response to the needs of that segment and a superior economic return for those competitors. Because market needs are not uniform, a multitude of competitors focused on different customer segments can prosper and better serve the market overall.

Furthermore, modern economic analysis has shown that markets evolve through life cycles over time, with customer familiarity with the purpose, use and selection of products growing as the market matures. In other words, customer needs change significantly over time. The additional diversity that this creates in the market provides further segmentation opportunities, which in turn support multiple competitors to better serve the entire breadth of customer needs.

- 2.1.4 The Schmalensee and Taylor argument is further based upon the fallacious assumption that production functions are the same across suppliers and cost variations are purely a function of scale of operations. Modern economic analysis has shown through countless empirical examples that in fact cost structures differ significantly among competitors, and the causal effects behind those cost

structures are at no time the same. Competitor costs are always different, and usually for reasons that have little to do with scale.

One of the major breakthroughs of modern economic analysis was the development of the concept of the experience curve. This principle holds that in a competitive environment unit costs decline directly with cumulative production (regardless of the scale of operations). This effect has been shown to exist across a wide range of industries, across product and service industries, and across consumer and industrial markets. As explained below, experience effects are important in allowing prices to decline continuously, providing continuous improvement in prices offered to customers and continuous incremental growth in market demand. Experience effects accumulated in serving different market segments have also been shown to be a stronger determinant of the viable number of competitors than the influence of scale noted by the Commenters.

Even when scale effects have a significant impact on unit costs, the appropriate arena for measuring scale can differ significantly among industries. The scale effects which create economic advantage can accrue across national operations, across local operations, across customers segments, or across other dimensions of economic activity. Classical microeconomics does not generally recognize this diversity in industrial structure, and in so doing incorrectly evaluates competitive industries. Competitors have a wide variety of mechanisms which are employed to lower unit costs and thereby lower market prices.

- 2.1.5 The Schmalensee and Taylor arguments for determining an equilibrium number of firms in an industry are also based upon the false premise that technology is static and constant across suppliers. Quite to the contrary, the normal real-world condition is that technology is a significant differentiator among competitors, especially in an embryonic high technology industry such as Location and Monitoring Services. Modern economic analysis recognizes the significant importance of both explicit technology and implicit, embedded technology in determining the ever-present differences among the cost structures of competitors. One of the more interesting corollaries of the experience curve is that the implicit technology used by a competitor to bring products to customers is changing every day that the firm is engaged in business, resulting in continuous reductions in real prices. Without the stimulus of competition, this rarely occurs.

Contrary to the assumptions of the Commenters, extremely significant and explicit differences can exist between the technologies employed by competitors. The scale of investment in research and development has been shown to be a poor predictor of the rate of technological innovation which will be achieved by a given competitor. The high technology industries in particular are replete with examples of small companies which have out-innovated larger, better funded companies. The high technology industries also provide good examples of the rich diversity of product and process technologies among competitors operating

in the same industry and nominally addressing the same markets. Of course, if there are only two firms in the market – as PacTel proposes – the public will be denied the benefits of this diversity.

The assumption by Schmalensee and Taylor that LMS technology is static and that there will be no further significant technological innovation among competitors is particularly invalid in an embryonic industry such as Location and Monitoring Services. In an embryonic industry competitors are by definition still developing the first levels of cumulative experience. That there is only one commercially deployed LMS service suggests that further innovation is to be expected since it is extremely unlikely (and in fact, unprecedented) that the first entrant captured all of the technical innovation possible in an industry. Indeed, Pinpoint believes, as do its investors, that it is proposing to market LMS services based on new, innovative technology which is a substantial improvement over that used by current licensees.

Another fundamental observation of modern economic analysis which is at odds with classic microeconomics is that both explicit and embedded technologies are proprietary to a business and are not easily or costlessly transferred among competitors. Competitive advantages based on technological differentiation are enduring when defended by well-managed firms. But, without competition these new technologies may never see the light of day. In a more competitive environment, different suppliers engage more furiously in technological innovation in attempts to gain and maintain economic advantages in serving their target market segments.

Both classical and modern economic analysis demonstrate that artificial constraints on the free entry and activity by current and potential competitors will tend to reduce the intensity and pace of technological innovation among competitors. Such constraints thereby serve to reduce the rate of price/performance improvement brought to customers, and consequently reduce the growth of demand due to such improvements. No amount of erroneous academic economics should persuade the FCC otherwise.

- 2.1.6 The arguments advanced by Schmalensee and Taylor that investors will be less likely (and, it is implied, unlikely) to invest in funding the entry of new competitors, or in funding research and development among existing competitors, is not a direct error from classical microeconomics, but rather is a unique error introduced by the apparent “industrial policy” orientation of the authors. This is an issue which both classical microeconomics and modern economic analysis recognize is automatically, adequately and appropriately addressed by the capital markets. Neither the self-appointed wisdom of the Commenters, nor the oversight of the regulatory authorities, is likely to have better insights and judgments than the many potential providers of risk capital in the market. What’s more, the FCC need not establish any elaborate structure to pick the appropriate LMS technology. Whether LMS is an appropriate area for

investment is best left to the self-interested judgment of professional investors, and economic analysis assures us that, in the aggregate, they will get it right. If investors are willing to fund new LMS entrants, as they are, then the assertions by Schmalensee and Taylor are patently wrong.

The fundamentally incorrect assumption behind the Commenters' position on investment is that all of the potential technologies to implement LMS are already known and available to all competitors. As stated earlier, modern business economics recognizes, however, that technologies differ among competitors, and over time. In an industry which is still embryonic, such as in this case, not all technological alternatives have been developed and presented to the market, and the industry has not yet gone through the natural process of evaluating and segregating superior and inferior technologies for offering Location and Monitoring Services. Investors in current and potential LMS competitors will continue to seek out new and innovative LMS technologies which can significantly improve the price/performance of LMS services. Investors will invest when they are presented with new technologies which can significantly improve over current and anticipated LMS technologies and which can allow them to earn a return large enough to compensate for the uncertainties described by Schmalensee and Taylor. Investment in all embryonic technology-driven industries occurs this way.

The arguments presented by the authors in this instance serve only to prop-up the current investors in existing LMS competitors which have not kept pace with the rate of technological innovation being set by other potential LMS service providers. These are the primary investors who would be protected by unnatural restrictions on competitive entry, to the extent that their investment is in a technology which does not maintain the rate of improvement in price/performance set by other potential competitors. Such protection obviously comes at the expense of consumers.

2.2 Unrestrained competition causes prices to decline.

Mr. Schmalensee and Mr. Taylor argue in Section II-B of their Comments that expanding the number of competitors does not necessarily reduce prices in the market. While the Commenters do concede that more competitors do tend to produce lower prices in most industries, this common phenomenon, they claim, will not occur in LMS services because of special conditions. They argue that the special conditions are that highly elastic demand will not result in significant price decreases from the entrance of new suppliers, that the mechanism for spectrum sharing will automatically create some degree of price collusion among competitors, and a repeat of their argument that duplicative fixed costs and uncertainty (as well as coordination costs) will burden the market with unnecessarily high unit capacity costs.

- 2.2.1 Schmalensee and Taylor have not adequately demonstrated that the special conditions claimed for LMS services which will allegedly exempt this industry from well-recognized economic principles are in fact conditions which are unique to LMS services or which will prevent an increased level of competition from producing lower prices. There are a wide range of markets with highly elastic demand, and many of these markets are well-served by a large number of suppliers and prevailing prices are driven down to levels approaching costs. The Commenters provide no empirical evidence to support their implication that markets with highly elastic demand are somehow associated with prices higher than would be expected under pure competition, and in fact most practical experience tends to indicate that just the opposite is true. Schmalensee and Taylor do, in fact, concede even with their assumptions that additional competitors will produce lower market prices, just not much lower. Lower prices, even just a little lower, are a desirable economic outcome and a benefit for all consumers. The Commenters' supporting argument itself disproves the initial assertion.

Similarly, the argument that the mechanism for spectrum sharing (and implied by the Commenters, all mechanisms for spectrum sharing) must necessarily increase price collusion among the competitors involved in sharing is unsupported and unexplained. Unanswered is the question how competitors using a common mechanism for sharing spectrum necessarily will engage in more price collusion than competitors using a common telecommunications infrastructure or a common banking system. Such a blanket assertion for all potential sharing mechanisms can not be taken seriously.

- 2.2.2 The arguments suggested by Schmalensee and Taylor that prices will not be reduced under spectrum sharing because industry costs will be increased by the entry of more competitors (e.g., duplicative fixed costs, uncertainty) have been addressed and refuted earlier. What the Commenters have not acknowledged is the well-recognized economic principle that monopoly control of a market by a competitor results in higher prices. This effect also applies to duopolies and oligopolies, although to a lesser extent. The real threat to achieving lower prices for LMS services comes from extreme limitations on competitive entry, not from the entry of additional competitors into the market. In this report, Schmalensee and Taylor appear to be arguing that monopolies serve the public better, something AT&T claimed for years before divestiture and deregulation. But whatever economic theories are used, monopolies seldom serve more than the private interest of the entrenched supplier. Although it is no surprise to see a monopoly local exchange carrier making these arguments, the Commission should pay no heed.
- 2.2.3 Overall, however, the approach taken by Schmalensee and Taylor to predicting the impact of competitive activity on pricing is erroneous. One of the primary tenants of modern economic analysis holds that individual suppliers in a market with open competition will undertake continuous investment in improving their

costs, that those costs will improve on a continuous and predictable basis from a variety of mechanisms, that cost improvements will be reflected in continuous reductions in prices to customers, that price reductions will increase aggregate demand in the marketplace, and that the growth in demand will provide additional operating experience and scale to competitors, which will in turn lead to additional incremental cost improvements.

The convoluted microeconomics argument advanced by the authors that elastic demand will not lead to meaningful price improvements by suppliers is directly at odds with this principle of modern economic analysis, and at odds with historical business experience. In fact, modern economic analysis points out that the rate of price reduction is greatest in industries which exhibit highly elastic demand (all other factors being equal), which is the exact opposite of the prediction by Schmalensee and Taylor. The specific example of the evolution of the personal computer industry, and of the entire computer industry in general, is a stunning refutation of their conceptual error. The original forecasts by IBM for the size of the personal computer market were roughly two orders of magnitude less than the actual results, and this severe underestimation came directly from their failure to correctly anticipate the cyclical causal relationship between highly elastic demand, lower prices, and the experience curve's cumulative impact on industry costs.

2.3 Increased competition will result in more efficient spectrum use.

Mr. Schmalensee and Mr. Taylor argue in Section II-C of their attachment to the PacTel filing that expanding the number of competitors will not result in more efficient spectrum use because more competitors will not increase aggregate demand, but will rather reduce aggregate capacity; and because more competitors will not create any additional incentives for competitors to improve efficiency or the rate of technological innovation.

- 2.3.1 The fallacious argument advanced to support the authors' incorrect conclusion is based on approaches to allocating spectrum use assuming that all competitors use the same, and current, technology. The most marked improvement in efficient use of spectrum (correctly defined by the authors as the greatest number of subscribers which can be served for a given allocation of bandwidth) will in fact come from improvements in the fundamental technologies used for providing LMS services. Competitors with superior technologies (those that make more efficient use of spectrum) will force competitors with inferior technologies to improve or be driven from the market. Indeed, elsewhere in this filing, Pinpoint shows how sharing can be implemented with a minimum of overhead and, therefore, with substantial efficiency.
- 2.3.2 The classical microeconomics argument used by Schmalensee and Taylor is that competitors will invest in technology to reduce costs and maximize profits, up to the point at which incremental investment is equivalent to incremental expected

return from cost reduction. Modern economic analysis recognizes that the imperative to invest in research and development in a fully competitive environment is more compelling than indicated by classic microeconomics. Competitors who do not continuously invest in technology and business improvement are not just foregoing potential incremental profits, but rather they are putting the entire business and its cumulative investment at risk. Competitors who continuously invest in technology will make continuous, unending improvements in their price/performance ratio, to the point that competitors who have foregone similar investment will not be viable in the marketplace because their costs will approach or exceed the continuously declining prices set by other competitors. In this case, customers and investors will force the laggard competitor to exit from the industry. These competitors face not just potential incremental profits foregone, but rather a much more severe penalty as laggards in innovation -- complete obsolescence of their total investment.

This encouragement to innovation and efficient spectrum use will not occur in a monopoly or duopoly, which probably explains PacTel's resistance to spectrum sharing. Only competition among multiple competitors can credibly provide the threat which forces all competitors to invest in innovation as if their economic lives depended on it. Only such competition, therefore, can serve the public's needs.

2.4 More competitors will increase technological diversity.

Mr. Schmalensee and Mr. Taylor argue in Section II-D of their paper that expanding the number of competitors for LMS services will not expand the technological diversity in the market because the number of competitors does not necessarily have a relationship to the degree of technological diversity being offered, and because the mechanism for spectrum sharing will necessarily limit technological diversity. The Commenters also add their assertion that this issue is unimportant anyway since the degree of technological diversity has no significant relationship to the diversity, quality or price of LMS services being offered to the market.

2.4.1 In their opening comments in this section, Schmalensee and Taylor state: "The technology for WBPR LMS systems is changing over time; different licensees currently use different systems with different technical characteristics which serve customers in different ways." (P. 20) While this is self-evidently true, they do not adequately explain why the technological diversity which has occurred with two competitors will not continue to increase with three or more suppliers in the market. A discontinuity between the technical diversity created by two competitors and that created by three or more competitors is implied by the Commenters, but neither explicitly stated nor supported. In fact, no such discontinuity exists, and additional suppliers beyond two will only expand the technical diversity created by the initial two competitors. This is especially true

since the existing two competitors appear to have adopted virtually identical technologies.

That more competitors will bring more technical diversity is supported by economic theory as well as, more importantly, by historical evidence. Additional competitors entering a market will by necessity bring new technological approaches into play in order to gain some differentiation from and advantage over existing competitors; duplicating the exact technology of entrenched competitors will not earn an adequate return on the investment required for entry. The argument that additional competitors will not increase technical diversity was also part of the argument for continuing monopoly regulation in long distance telephone services. The results of deregulation in that market indicate that just the opposite has occurred -- that open competition has stimulated both the rate and diversity of technical innovation (as well as stimulating lower prices and increasing the diversity of other elements of customer service). Additional competitors clearly stimulate greater technical diversity, and increase the multiple benefits to consumers which result therefrom.

Schmalensee and Taylor also claim that spectrum sharing will limit technological diversity. But, it is axiomatic that PacTel's duopoly will have far fewer providers, and thus fewer avenues for technologies to reach the marketplace, than the Commission's proposed competitive scheme. Even if spectrum sharing did constrain technological diversity, which Pinpoint disputes, it would provide substantially more diversity than the regime PacTel proposes.

- 2.4.2 The Commenters' argument that the geographic diversity of the market for LMS services allows a single competitor to implement diverse technologies in different markets is false. Many of the applications for LMS services are national in scope. For example, a vehicle being monitored for security purposes in Chicago must be capable of still being monitored when in Los Angeles on vacation. More compellingly, many of the vehicle fleets which are potential users of LMS services belong to national companies (i.e., Federal Express, Sears), and these companies will require a national system solution to allow flexibility and ease of implementation and support. The use of diverse technologies among different geographic markets, and the resulting incompatibility across the "national" LMS network, would preclude the ability to provide service to nation-wide applications, and no rational LMS competitor would walk away from these significant markets. Geographic diversity in the market has little impact on the creation of technical diversity in the industry, as evidenced by the fact that PacTel itself proposes to use the identical technology in all of its markets.
- 2.4.3 The assertion by Schmalensee and Taylor that the number of LMS service licensees does not limit technical diversity because multiple independent companies can and will engage in research and development in LMS technology is misleading. The technology of LMS services is inherently a systems technology

in which a number of distinct components must work together in a concerted fashion according to a system architecture. This system architecture will be dictated by the LMS service provider which has strong incentives to take responsibility for the overall technology because it has such significant implications for the company's competitive position and economic return, as previously explained. The fact that PacTel purchases LMS system components from multiple suppliers is irrelevant because these companies (such as Mitsubishi for vehicle location units and Tadiran for base stations) are merely contract manufacturers of components according to a system architecture and functional design dictated by PacTel. A similar situation exists, for instance, for the contract manufacturers of system components for Mobilevision and Pinpoint. These manufacturers are not performing independent research and development and are not introducing any elements of technical diversity into the LMS systems of their customers, the LMS service providers.

- 2.4.4 The Commenters' attempt to draw an analogy between the cellular mobile telephone market and the LMS services market is specious. Cellular mobile telephone is not an open market for technology, but rather is severely constrained by the Commissions regulations into the sort of duopoly PacTel proposes, with little technological variation permitted among competitors. The large number of component manufacturers are all producing to the exact same standards and underlying technology. Even the potential diversity in migrating to a digital technology (i.e., TDMA and CDMA approaches) is being largely argued and resolved in the standards setting and regulatory arenas, and it is uncertain that competing digital technology standards will be allowed to be implemented jointly. In LMS, with the proposed spectrum sharing, the Commission has the opportunity, from the beginning, to promote technological diversity.

3.0 Effects Of Additional LMS Competitors

- 3.1 Multiple suppliers do not increase market prices by increasing the costs of serving demand.

In their attachments to the PacTel Comments filing, Mr. Schmalensee and Mr. Taylor state in Section III-A that the costs of serving demand are higher with more than one supplier because resources required to serve the market are duplicated and that spectrum overhead is duplicated. They imply that these higher costs will by necessity be passed on to customers in the form of higher prices.

- 3.1.1 In this section the Commenters are again reprising their earlier argument that any market which requires any fixed costs to serve is inherently more efficiently served by a single supplier because fixed costs are duplicated with additional suppliers, and in such a case "the market price ... should be higher ... because it must recover the combined fixed costs of all firms in the market." (p. 28-29) As

explained earlier, the conclusion reached by the Commenters is false according to either classical or modern microeconomic theory, and more importantly, is disproved by the existence of multiple competitors in almost every identifiable market, given that every market requires some level of fixed costs to enter and serve. Obviously many more significant factors are at work which determine competitors' costs and market prices, and those considerations have been explained in detail earlier.

In particular, the assertion by Schmalensee and Taylor here and throughout their analysis that the market must cover the aggregate costs of the industry is fallacious. Customers do not purchase services from the industry as a whole, but rather purchase services from individual suppliers. Customers do not need to purchase from suppliers which have inefficient operations, which employ inferior technology, and which offer inadequate service, and in fact customers will, at the margin, not purchase from such suppliers. Such suppliers, and their investors, will discover that the market prices set by stronger and superior competitors will not cover costs, and these inferior competitors will be eliminated from the market by the rational purchase decisions of customers. In a competitive market, customers are not required to help recover the investments or fixed costs of inferior competitors, but rather the economic value of the investments in inferior competitors is wasted. Economic history is full of examples of companies on whom competitive markets have imposed their severe but objective discipline, and many of those companies no longer exist as independent economic entities. Rather than being burdened by the inefficiencies of inferior competitors through the regulatory protection sought by PacTel, the market -- and the consuming public -- is better served with their elimination through superior service and lower prices.

- 3.1.2 The argument by Schmalensee and Taylor is further based on the fallacious assumption that technology is static, available to all competitors, and that this ideal technology will be fully implemented by the incumbent single supplier. As detailed earlier, modern economic analysis points out that all of these assumptions are not true. The Commenters' model arguing that additional competitors will actually raise the average costs of LMS services and reduce aggregate industry capacity is incorrect and does not reflect real-world conditions and behavior.

4.0 Conclusion

PacTel's attempt at an "objective" economic analysis justifying shelter from a competitive LMS marketplace is replete with errors. As the Commission has found for over 25 years, competition, not monopoly or duopoly, best serves the public interest through lower prices, increased innovation, and diversified services. At its core, PacTel's claim is that LMS is a "natural duopoly." But, PacTel offers no proof and there is none; indeed, the best evidence to the contrary is the desire of Pinpoint and others to enter the market. Moreover, PacTel's

analysis fails to consider more up-to-date economic theory, which confirms that a competitive LMS environment will support a large and diverse group of suppliers, will reduce prices to end users, and will boost spectrum efficiency, all without increasing underlying costs. For these reasons, competition, not duopoly, is the best approach for LMS.

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